



# SORAPRO Installation Guide

## Real Time Energy Metering

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## **IMPORTANT SAFETY INFORMATION**

This manual contains important safety and operating information. Please read and follow the instructions in this manual. Failure to do so could be hazardous and result in damage to the hardware.

### **DANGER! HIGH VOLTAGE HAZARD**

*INSTALLATION OF ANY SORAPRO IS FOR QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRICAL SHOCK, DO NOT INSTALL OR SERVICE ANY SORAPRO HARDWARE UNLESS YOU ARE A QUALIFIED TO DO SO*

## **GETTING STARTED**

This guide will help you properly install the SORAPRO monitoring equipment. It is important to read through all of the installation steps prior to installing any equipment. Read through the instructions, visualize where all the equipment will need to be installed and do a soft installation before mounting any equipment. If you do not understand the instructions in full, please contact SORAPRO Support at 609-807-8307.

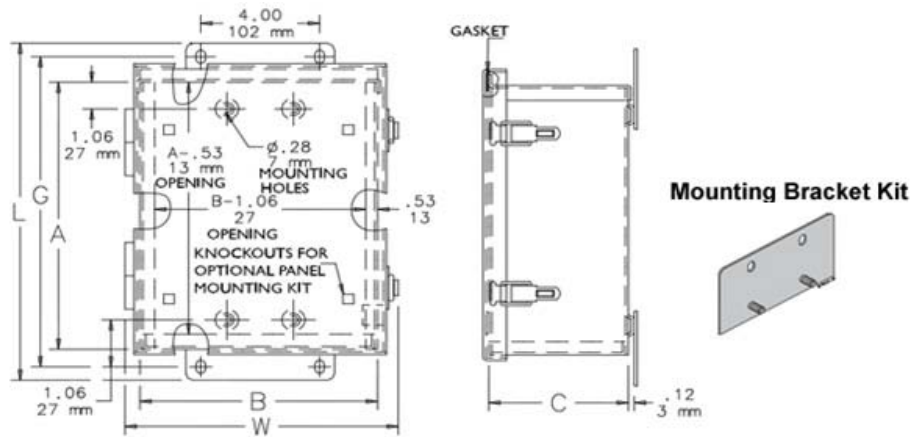
### **How SORAPRO Works:**

SORAPRO was developed to be easy to install while providing Real Time energy metering and monitoring from anywhere on the planet. The metering equipment gathers revenue grade (ANSI C12) data from the site through Current Transformers (CT's). This information is transferred to remote servers through an internet gateway and is processed for accuracy before being stored. Once stored, this data is analyzed to establish if the solar array is working properly, based on criteria specified by the installer through the user interface. Any discrepancies are reporting in real time to specified users as warning or errors through email alerts. The errors will continuously report to the users until the discrepancies are rectified.

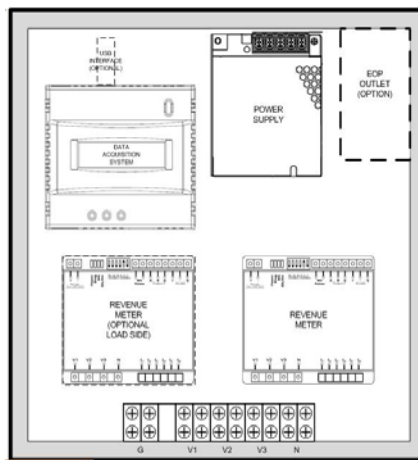
### **Inside this Package:**

Prior to commencing installation, please confirm that the following components were received in your SORAPRO installation package.

1. *Hinged-Cover Lift-Off Type 3R Enclosures*



## 2. Metering equipment (pre-assembled)



## 3. Wall mounting hardware

## 4. Current Transformers (1 per phase)

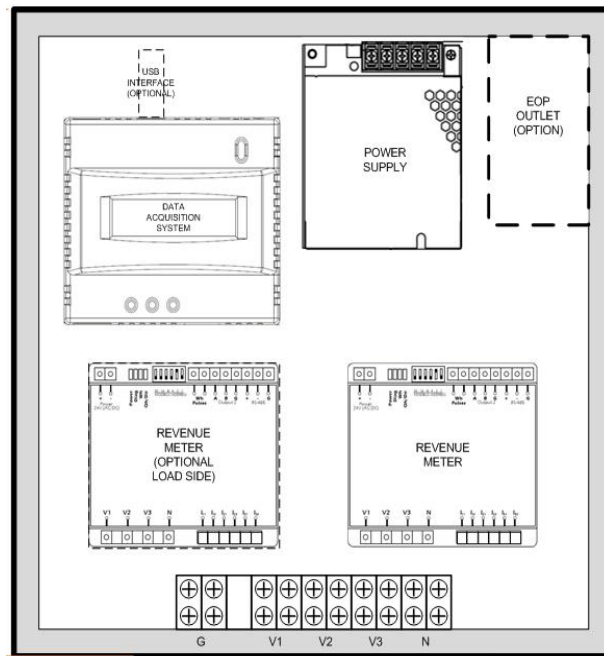


**Current Transformer**

The following equipment is also required to complete the SORAPRO installation. Manufacturer of each component will vary depending on the equipment specified for the solar installation.

1. 3-Pole 5A Circuit Breaker
2. 14 AWG, 600V wire
3.  $\frac{3}{4}$ " Conduit (or larger) with Liquid-Tite fittings
4. CAT5 cable

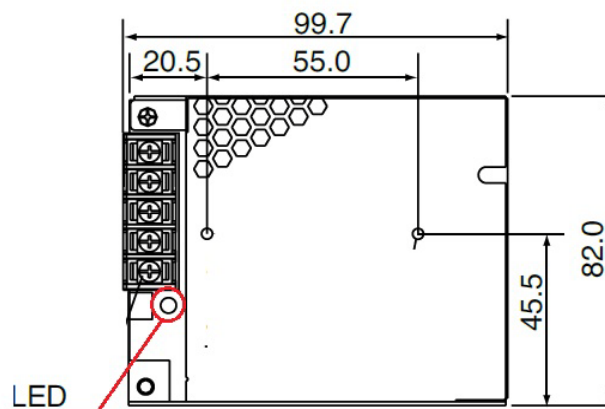
## SORAPRO HARDWARE



Within the SORAPRO monitoring device are several pieces of hardware that serve individual purposes.

### Power Supply:

The unit contains a 50W power supply. This power supply takes a 120VAC input and transforms it to 24VDC for supply to the revenue meter(s) and the datalogging device. On the power supply is a green LED indicator. Contact SORAPRO immediately if this indicator is not lit green when commissioned.



### Revenue Meter(s):

The unit contains a revenue grade metering device for measuring power data. The unit uses current transformers to measure amperage through a wire. DO NOT USE ANY OTHER CT's WITH THIS DEVICE THAN THE ONES CONTAINED IN THE SORAPRO PACKAGE. Use of other CT's could damage metering equipment and cause product failures.

The data is measured by the metering device and send via RS485 transmission the data acquisition center for logging and transmission through the internet gateway.

If you have purchased SORAPRO with the Load Side Monitoring Option, the unit will contain two revenue grade metering devices. One device will be labeled "PV" and the second device will be labeled "LOAD". To ensure proper data collection, make sure to connect the corresponding CT's to the correct meter.

PV – CT's should be connected to the output of the solar subpanel which is combining the AC power of all of the systems inverters.

LOAD – CT's should be connected to the input of the main service panel where power is being supplied to the building, not the PV output.

### Data Acquisition Server:

The unit contains one data acquisition server and can support up to 32 RS485 devices. This server collects data from the connected devices. The data is time stamped and stored in onboard memory. Using an Ethernet connection, this data is pushed to SORAPRO data servers through an internet gateway using HTTP protocol.

## **INSTALLATION OVERVIEW**

See Appendix A for a Quick Installation Guide.

Each device in contained within the SORAPRO unit is pre-configured and assembled by SORAPRO before shipping. To install the device, follow the following steps and reference the Quick Installation Guide.

### To install a PV ONLY monitoring device:

1. Choose a location for the SORAPRO unit that is within 10' of the solar output source. You may connect the device to the main interconnection panel or a solar subpanel as long as the device is

- within 10' from the source to be metered and there are enough open breaker spaces to connect the proper breaker to.
2. The SORAPRO unit will need a 2p5A breaker in a single, or split phase application and a 3p5A breaker in a three phase application. Determine the site AC voltage configuration and determine which breaker you will need.
  3. Install the proper breaker to supply AC power to the unit. In order to ensure proper metering, the CT's must be installed in the same panel as the breaker you are installing in this step.
  4. Install the CT's on the solar output wires.
  5. Install a watertight, 3/4" or larger conduit from the breaker panel to the SORAPRO device.
  6. Using the conduit from step 5, run 14 AWG, solid, copper wire from the breaker panel to the SORAPRO device.
  7. Using the conduit from step 5, run the CT wires from the breaker panel to the SORAPRO device. The SORAPRO device will come standard with 10' leads on the CT's. Loop any excess wire; do not cut it off.
  8. Connect the AC supply wire from the breaker to the V<sub>1</sub>, V<sub>2</sub>, and V<sub>3</sub> (if necessary) to the terminal block within the unit.
  9. Connect the CT wire the CT inputs on the metering device. These inputs should be clearly labeled as I<sub>11</sub>, I<sub>12</sub>, I<sub>21</sub>, I<sub>22</sub>, I<sub>31</sub>, and I<sub>32</sub>.
  10. Connect the Ethernet (LAN) wire to the port labeled "Ethernet Port" on the bottom of the Data Acquisition device.
  11. Turn on power to the SORAPRO device and ensure the following:
    - a. A green LED is lit on the top of the metering device.
    - b. A green LED is lit on the top of the power supply.
    - c. Amber LEDs should be flashing on the data acquisition server and the power indicator should be lit.
  12. Call SORAPRO to complete the commissioning of the device with the SORAPRO online software.

#### To install a PV and LOAD monitoring device:

1. Choose a location for the SORAPRO unit that is within 10' of the main panel.
2. The SORAPRO unit will need a 2p5A breaker in a single, or split phase application and a 3p5A breaker in a three phase application. Determine the site AC voltage configuration and determine which breaker you will need.
3. Install the proper breaker to supply AC power to the unit. In order to ensure proper metering, the CT's must be installed in the same panel as the breaker you are installing in this step.
4. Install the CT's on the solar output wires.
5. Install a watertight, 3/4" or larger conduit from the breaker panel to the SORAPRO device.

6. Using the conduit from step 5, run 14 AWG, solid, copper wire from the breaker panel to the SORAPRO device.
7. Using the conduit from step 5, run the CT wires from the breaker panel to the SORAPRO device. The SORAPRO device will come standard with 10' leads on the CT's. Loop any excess wire; do not cut it off.
8. Connect the AC supply wire from the breaker to the  $V_1$ ,  $V_2$ , and  $V_3$  (if necessary) to the terminal block within the unit.
9. Connect the PV CT wires the PV CT inputs on the metering device. These inputs should be clearly labeled as PV:  $I_{11}$ ,  $I_{12}$ ,  $I_{21}$ ,  $I_{22}$ ,  $I_{31}$ , and  $I_{32}$
10. Connect the LOAD CT wires the LOAD CT inputs on the metering device. These inputs should be clearly labeled as LOAD:  $I_{11}$ ,  $I_{12}$ ,  $I_{21}$ ,  $I_{22}$ ,  $I_{31}$ , and  $I_{32}$
11. Connect the Ethernet (LAN) wire to the port labeled "Ethernet Port" on the bottom of the Data Acquisition device.
12. Turn on power to the SORAPRO device and ensure the following:
  - a. A green LED is lit on the top of the metering device.
  - b. A green LED is lit on the top of the power supply.
  - c. Amber LEDs should be flashing on the data acquisition server and the power indicator should be lit.
13. Call SORAPRO to complete the commissioning of the device with the SORAPRO online software.

## NETWORK COMMISSIONING



Plug in your Network Connection



Internet Router

### Basic Network Configuration

The IP address of the AcquiSuite™ server can be implemented using one of two methods. Check with the network administrator to determine which method applies. **By default the server is configured for Dynamic Host Configuration Protocol (DHCP).**

- Static IP address - this is a fixed IP address which is assigned by a network administrator and configured into the AcquiSuite.
- Dynamic Host Configuration Protocol (DHCP) address - this process assigns an IP address dynamically to the AcquiSuite when it is connected to the network from a host DHCP server

**For Static IP address you will need the following information from the network administrator.**

You will need the following information from your network administrator: The addresses will be in the form of "###.###.###.###"), where "#" refers to the numbers 0 to 9.

- IP Address \_\_\_\_\_.\_\_\_\_\_.
- Network Mask \_\_\_\_\_.\_\_\_\_\_.
- Gateway \_\_\_\_\_.\_\_\_\_\_.
- DNS Server \_\_\_\_\_.\_\_\_\_\_.
- DNS Server 2 \_\_\_\_\_.\_\_\_\_\_.
- HTTP Proxy \_\_\_\_\_.
- Proxy Server Port: \_\_\_\_\_.



## Static IP Address Setup:

### **Step 1:**

LCD display, press and hold the menu (top) button on the server for several seconds and the message should appear. To change the IP address to the static address assigned by the network administrator, do the following:

**A.** Press the menu (top) button once to get the TCP/IP configuration menu

**[Main Menu]  
TCP/IP Config**

**B.** Press the select (bottom) button twice to get the IP config menu:

**[TCP/IP Config]  
IP Address**

**C.** Press the select button again to see the IP address menu:

**[IP Address]  
192.168.40.50**

**D.** At this point, the cursor on the display will be blinking on the first number in the IP address on the second line.

**E.** To change the number, press the menu (top) button and the display will cycle through the digits 0-9 as well as ".". Once the correct digit is displayed, press the select (lower) button to advance to the next digit and repeat the process until all the digits are correct.

**F.** Once the IP address on the AcquiSuite matches the assigned IP address, press the select (bottom) button once more to return to the main TCP/IP menu.

### **Step 2:**

Set the netmask, gateway, and DNS server(s) addresses using the same technique as shown above. The only change is that after Step B, press the menu (top) button multiple times to see the netmask, gateway, and DNS setup menu, then push the select button to set the option.

**Note:** If DHCP configuration is selected, the IP, netmask, gateway, and dns server addresses will be obtained automatically. Simply select the "Enable DHCP" from the first TCP/IP configuration menu.

### **Step 3:**

After the address information has been set, you must reboot the AcquiSuite. Select the "(Previous Menu)" option after step B above. The menu will then state that the AcquiSuite must be rebooted to take effect. Press 'select' to allow the AcquiSuite to reboot.

Once the AcquiSuite has rebooted, the new IP address will be displayed on the console. If DHCP addressing was specified, the server assigned address will be displayed.

Note: if DHCP is unable to obtain an IP address, the AcquiSuite will use the fallback address of 192.168.0.100.

## **INSTALLATION CHECKLIST**

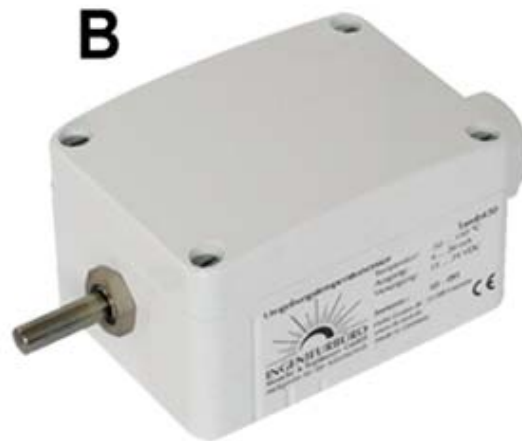
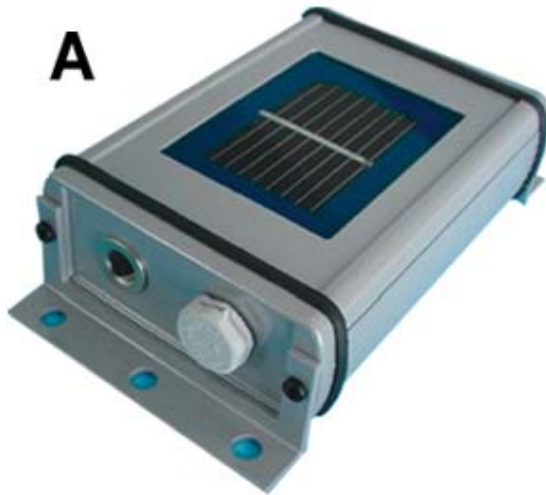
Three –phase systems are often to be installed in commercial buildings with secured computer networks. Always contact the local network administrator and verify the following:

1. Network Port 80 is open for both incoming and outgoing signals
2. The network router is configured to use DHCP.
3. If the network cannot be configured to use DHCP, the AcquiSuite unit must be configured with a static IP address. See "Static IP Address" under "Network Configuration" for more information.
4. The AcquiSuite should display its IP address on the LCD screen.

After installing SORAPRO hardware, make sure the following has been completed before leaving the site:

1. The CT's are installed on the correct lines and that they are facing the correct direction of current flow.
2. The AcquiSuite is displaying kW readings on the LCD screen.
3. The readings on the AcquiSuite make sense under current conditions.
4. All accessories that you have installed have been installed according to their installation manuals.
5. After you have verified that the installation has been done correctly and that the network is sending and receiving information, **call SORAPRO to activate the device at (609) 807-8307**

## ACCESSORIES



- A Silicon Irradiance Sensor**
- B Ambient Temperature Sensor**
- C Windspeed Sensor**
- D Wind Direction Sensor**
- E R485 to USB**

## **TROUBLESHOOTING**

Line voltages up to 600 VAC are present on the input terminals of the device and throughout the connected line circuits during normal operation. **THESE VOLTAGES MAY CAUSE SEVERE INJURY OR DEATH.**

**Installation and servicing must be performed only by qualified, properly trained personnel.**

**The following tools are helpful in diagnosing hardware installation issues:**

1. Digital Multimeter capable of mV AC and mA AC measurements.
2. Clamp on Amp meter to verify current in line (if possible).
3. Basic electrician tools.



<b>The “Alive” light does not come on or LCD display it not lit.</b>	Verify connection on the terminal block.
<b>Ethernet Link/Act light off</b>	Inspect the cat5 cable for damage. Make sure the colored wires inside the connectors are all in the correct location.
<b>Failed to upload files displayed on LCD</b>	Verify the internet link/act light next to the Ethernet port is on. The light will blink with activity.
<b>Unknown device displayed on LCD</b>	The AcquiSuite takes between 2 and 5 minutes to detect the devices after a reboot.
<b>Alarm light blinks</b>	Contact technical support at 609-807-8307 Monday – Friday from 8am to 6pm EST.



## Troubleshooting steps for Elkor WattsOn

WattsOn Meters calibrated for use with 5A CTs have special precautions that must be taken. NEVER disconnect a 5A CT without shorting it first. These CTs are capable of producing very high voltages and arcing when not shorted, and as a result may cause serious injury or death!

**Always ensure that 5A CTs are shorted via a shorting block, or that power to the circuit which the CT is installed on is off before disconnecting from the meter.**

WattsOn meters with 5A inputs may be identified by the part number (ie: WattsOn-1100-5A), or by the yellow sticker on the face of the unit as below:

Before commencing other troubleshooting steps, ensure that the WattsOn is receiving a proper power supply. Power to the WattsOn is provided by to the upper left (black) plug in two-position connector.

The green Power LED should illuminate when the WattsOn is receiving power, however note that the LED will continue to be illuminated even during low voltage conditions. That is, the LED is not an indication of WattsOn "sanity" or "operation", but rather that power is simply available. Note that voltages can sag when other equipment is powered on, especially when using a small VA control transformer. Therefore, it is best to verify the input voltage using a DMM, on the terminals of the black plug-in power connector to ensure that the proper voltage is present.

The Red DIAG (diagnostic) LED has a variety of functions. Depending on the state of the LED, it can signify a number of conditions. The table below summarizes the LED states and related conditions:

## LED State Condition

LED State	Condition
OFF	Normal operation, or insufficient power supply voltage (see step 1)
Fast Flashing	Input Voltages below threshold (typically $\leq 25\text{VAC}$ ).
Solid (ON)	Reverse NET Power (kW) condition
Slow Flashing	Reverse Sequence (typically this is disabled from the factory)
Double-Flash, pause, Double-Flash	Firmware update mode check: DIP Address switch must not be "0". Potential firmware problem.

To test for WattsOn functionality, it is best to connect power and disconnect voltage inputs. In this configuration, the RED LED should flash rapidly. This is an indication of proper operation.

During normal measurement operation (i.e. voltage inputs above 25VAC), the DIAG LED should be OFF. If the LED stays ON constantly, or turns on and off erratically, it is an indication of reverse power detection. This condition arises when the SUM of the real power (watts) in all three phases is negative. Please note however, in a three-phase system (assuming balanced phases), if only one of the phases is reversed, the NET will continue to be positive.

## TECHNICAL DATA

SORAPRO	
INPUTS	
<i>Voltage</i>	100 to 240 VAC
<i>Voltage Range</i>	88 to 264 VAC
<i>Current</i>	1.8A max
<i>Frequency</i>	60 Hz
OUTPUTS	
<i>Wh/Qh</i>	solid state relay
<i>RS485</i>	Modbus RTU
<i>Start time</i>	1000 ms max
<i>Rise time</i>	30 ms max
DEVICE	
<i>Power Supply</i>	24 VDC
<i>Accuracy</i>	ANSI C12.20 Class 0.2%
<i>Operating Temp</i>	-10 to 60 C
<i>Isolation</i>	2500 VAC to one minute / 1500 VDC
<i>Enclosure</i>	12x12x6
<i>Weight</i>	8 lbs

## **SUPPORT**

We encourage your feedback. Please contact us by mail at:

**Future Solutions Technologies, LLC  
120 Route 156  
Yardville, NJ 08620**

Phone Support is available between the hours of 8:00AM and 6:00PM EST.  
For phone support, please call:

**(609) 807-8307 (Phone)  
(609) 888-3971 (Fax)**

Email Support is also available at:

[support@sorapro.com](mailto:support@sorapro.com)

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**Future Solutions Technologies, LLC  
120 Route 156  
Yardville, NJ 08620 U.S.A**



## **WARRANTY**

### **5 Year Warranty**

A five year warranty applies to the following products: VR11, VC11, VC21.

### **Extended Warranty**

An extended 5 year warranty can be purchased for any device with a 5 Year Standard warranty. This extended warranty is an extension of 5 years on the Standard Warranty, from the date of the original warranty period.

Please contact the SORAPRO service line at (855)SORAPRO for more details regarding the extended warranty.

The Standard Warranty covers any repair or replacement costs incurred during the warranty period, beginning on the device's purchase date, subject to the following conditions.

### **Warranty Conditions**

If after contacting SORAPRO for support it has been determined that a device is defective, one of the following services will be selected by Future Solutions Technologies, will be performed at no charge for materials or labor costs:

- Repair at Future Solutions Technologies
- Exchange for an equivalent Replacement Device

In the event of receipt of a Replacement Device, the warranty will continue on the new device from the original purchase date of the defective device. The defective device should be packaged in the same packaging and returned to Future Solutions Technologies. If the defective device is not received by Future Solutions Technologies with 5 business days, charges for the Replacement Device will apply.

Please contact support at (855)SORAPRO with questions regarding potentially defective devices.

### **Warranty Exclusions**

The following will result in Warrant Exclusions:

- Incorrect installation
- Tampering with pre-configured components

- Attempted repairs not conveyed by Future Solutions Technologies support personnel
- Incorrect use
- Improper device ventilation
- Installation in direct sunlight, without optional sun deflector
- Force Majeure (i.e. lightning, fire, animals, etc)

Claims for compensation for damages due to loss of profits or due costs are excluded if no legal liability applies.

## APPENDIX A

